

MASONRY I

COURSE DESCRIPTION

Masonry I is a course that will introduce students to basics skills and knowledge related to masonry construction in residential and commercial structures. Topics covered include safe practices, interpretation of construction drawings, basic laying techniques, masonry reinforcement, arch construction, and accommodations for weather. This course gives students an introduction to the skill and knowledge base typically required for apprentice masons.

Prerequisite(s):

Construction Core

Algebra I or Math for Technology II (may be concurrent)

Recommended Credits:

1

Recommended Grade Level(s):

11th

MASONRY I STANDARDS

- 1.0 Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.
- 2.0 Students will take personal responsibility for the safety of themselves, their coworkers, and bystanders.
- 3.0 Students will interpret, lay out, and fabricate in conformance to construction drawings and written specifications.
- 4.0 Students will lay new masonry units around openings and in replacement situations.
- 5.0 Students will analyze the loads that act on reinforced masonry structures.
- 6.0 Students will modify masonry processes based on weather conditions.
- 7.0 Students will demonstrate bonding and reinforcement in masonry structural members.

MASONRY I

STANDARD 1.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

LEARNING EXPECTATIONS

The student will:

- 1.1 Cultivate leadership skills.
- 1.2 Participate in SkillsUSA-VICA as an integral part of instruction.
- 1.3 Assess situations within the school, community, and workplace and apply values to develop and select solutions.
- 1.4 Demonstrate the ability to work cooperatively with others.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 1.1.A Takes initiative in meetings to actively influence the results of deliberations.
- 1.1.B Uses critical-thinking and consensus building skills in group deliberations.
- 1.2.A Applies high ethical standards to personal, community, and professional situations.
- 1.2.B Participates and conducts meetings according to accepted rules of parliamentary procedure.
- 1.3.A Analyzes simulated workplace situations and uses problem-solving and critical-thinking techniques to suggest solutions to the problem.
- 1.3.B Analyzes socio-economic conflicts associated with the construction industry and applies values to evaluate possible ways to mitigate the conflicts.
- 1.4.A Participates in a committee.
- 1.4.B Contributes to a group project.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Create a leadership inventory and use it to conduct a personal assessment.
- Participate in various SkillsUSA-VICA or similar programs and/or competitive events.
- Evaluate a civic project within the school, community, and/or workplace and evaluate the expected long-term effects of the project.
- Prepare a meeting agenda for a school or a community meeting.
- Attend the meeting of a professional organization.
- Participate in a design team to complete an assigned project.

INTEGRATION LINKAGES

SkillsUSA-VICA, *Professional Development Program*, SkillsUSA-VICA, Communications and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Algebra, Geometry, Applied Communication, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

MASONRY I

STANDARD 2.0

Students will assume responsibility for the safety of themselves, their coworkers, and bystanders.

LEARNING EXPECTATIONS

The student will:

- 2.1 Demonstrate a positive attitude regarding safety practices and issues.
- 2.2 Use and inspect personal protective equipment.
- 2.3 Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.
- 2.4 Continuously respond appropriately to potential hazards to self and others.
- 2.5 Assumes responsibilities under HazCom (Hazard Communication) regulations.
- 2.6 Performs in accordance with responsibilities, regulations, and company policies to protect coworkers and bystanders from hazards.
- 2.7 Adheres to responsibilities, regulations, and company policies regarding reporting of accidents and observed hazards and regarding emergency response procedures.
- 2.8 Demonstrate appropriate related safety procedures.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 2.1.A Is attentive during safety discussions.
- 2.1.B Actively seeks information about safe procedures.
- 2.1.C Responds positively to instruction, advice, and correction regarding safety issues.
- 2.1.D Does not deliberately create or increase hazards, such as by horseplay, practical jokes, or creating distractions.
- 2.1.E Reports to school or work physically ready to perform to professional standards, such as rested, or not impaired by medications, drugs, alcohol, and so forth.
- 2.2.A Selects, inspects, and uses the correct personal protective equipment for the assigned task.
- 2.3.A Inspects power tools for intact guards, shields, insulation, and other protective devices.
- 2.3.B Inspects extension cords for the presence of a functional ground connection, prior to use.
- 2.3.C Operates and maintains tools in accordance with manufacturer's instructions and as required by regulation or company policy.
- 2.3.D Properly place and secure ladders and scaffolding prior to use.
- 2.4.A Is observant of personnel and activities in the vicinity of their work area.
- 2.4.B Warns nearby personnel, prior to starting potentially hazardous actions.
- 2.5.A When tasked to use a new hazardous material, retrieves MSDSs, and identifies the health hazards associated with the new material.
- 2.5.B Reports hazards found on the job site to their supervisor.
- 2.6.A Erects shields, barriers, and signage to protect coworkers and bystanders prior to starting potentially hazardous tasks.
- 2.6.B Provides and activates adequate ventilation equipment as required by the task.
- 2.7.A Reports all injuries to themselves to their immediate supervisor.
- 2.7.B Reports observed unguarded hazards to their immediate supervisor.
- 2.7.C Comply with personal assignments regarding emergency assignments.

- 2.8.A Passes with 100 % accuracy a written examination relating to safety issues.
- 2.8.B Passes with 100% accuracy a performance examination relating to safety.
- 2.8.C Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Practice drill simulating a hazardous solvent spill in which an emergency action plan is to be implemented.
- Instruct a visitor to obviously approach the vicinity of a student conducting a hazardous activity and note the level of awareness demonstrated by the student.
- For a project requiring the use of ladders and/or scaffolding, note the proper placement and securing procedures followed by students.

INTEGRATION LINKAGES

Science, Computer Skills, Research and Writing Skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Algebra, Geometry, Applied Communication, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development

MASONRY I

STANDARD 3.0

Students will interpret, lay out, and fabricate in conformance to construction drawings and written specifications.

LEARNING EXPECTATIONS

The student will:

- 3.1 Interpret dimensions and locations of components that are explicitly dimensioned in construction drawings and written specifications.
- 3.2 Interpret plan and elevation views shown in construction drawings.
- 3.3 Recognize and correctly interpret lines and symbols commonly used in construction drawings.
- 3.4 Make layouts of locations and elevations of masonry structural elements and reinforcements.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 3.1.A Makes a material take-off in conformance to construction drawings and specifications.
- 3.1.B Lays out components, structural and others, and their locations to dimensions and tolerances indicated on construction drawings and written specifications.
- 3.2.A Interprets three-dimensional features found in construction drawings.
- 3.3.A Distinguishes between object lines, dimension and extension lines, center lines, section lines, and other lines commonly found in construction drawings.
- 3.3.B Identifies symbols commonly used in construction drawings, including material, window and door, electrical, plumbing, HVAC, and plot plan and survey symbols.
- 3.3.C Correlates symbols in construction drawings for masonry reinforcement, flashing, and finished details with their physical locations and components.
- 3.4.A Lays out locations and elevations of masonry structures, based on construction drawings.
- 3.4.B Lays out locations for steel reinforcement and grouting, based on construction drawings.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Given a set of plans and specifications for a residential or commercial structure, make a complete material take-off for the masonry structures.
- Given a set of plans and specifications for a residential or commercial structure, determine the location of masonry structures not explicitly dimensioned.
- Determine the coordination required to allow rough-in with other trades such as electrical and plumbing during a construction project.
- Examine an existing masonry structure for plumb and straight.

INTEGRATION LINKAGES

Science, Computer Skills, Research and Writing Skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Algebra, Geometry, Applied Communication, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders

and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development

MASONRY I

STANDARD 4.0

Students will lay new masonry units around openings and in replacement situations.

LEARNING EXPECTATIONS

The student will:

- 4.1 Saw and cut masonry units.
- 4.2 Lay-up jambs, lintels, and sills.
- 4.3 Demonstrate the techniques used in toothing and patching various types of masonry.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 4.1.A Cuts masonry units using wet or dry techniques.
- 4.1.B Takes appropriate safety precautions while sawing and cutting.
- 4.2.A Selects the appropriate materials for jambs, lintels, and sills.
- 4.2.B Lays up jambs, lintels, and sills as specified in construction drawings.
- 4.3.A Demonstrates toothing an area with proper wall alignment and required jointing.
- 4.3.B Demonstrates patching an area in a brick replacement situations.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Lay out and construct a masonry project, accurately cutting and placing masonry units around openings, as specified in construction drawings.
- Patch an existing masonry structure, replacing brick, stone, or tile as necessary.

INTEGRATION LINKAGES

Science, Computer Skills, Research and Writing Skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Algebra, Geometry, Applied Communication, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development

MASONRY I

STANDARD 5.0

Students will analyze the loads that act on reinforced masonry structures.

LEARNING EXPECTATIONS

The student will:

- 5.1 Analyze vertical loads on masonry structures.
- 5.2 Analyze lateral loads on masonry structures.
- 5.3 Analyze how masonry structures develop reaction to applied loads.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 5.1.A Determines live loads on floor and roof structures for residential and commercial buildings based on intended use and the building codes.
- 5.1.B Determines dead loads on masonry structural components such as walls and columns for residential and commercial buildings based on construction drawings or proposed designs.
- 5.2.A Determines lateral wind loads on residential and commercial buildings based on location, weather history, and building codes.
- 5.2.B Determines lateral loads on a retaining wall.
- 5.3.A Solves static equilibrium problems, including those with multiple point forces and distributed forces.
- 5.3.B Analyzes reaction forces and moments required of simple beam and column structures, subject to point and distributed loads.
- 5.3.C Designs reinforced masonry column, beam, and wall structures for given loads in accordance with industry practice and building codes.

SAMPLE PERFORMANCE TASKS

- Determine live loads for a two-story commercial structure to be used as a print shop.
- Determine dead loads on a wall by analysis of blueprints for a residential or small commercial structure.
- Determine the lateral loads on a masonry retaining wall for a specified application and propose a design.

INTEGRATION LINKAGES

Science, Computer Skills, Research and Writing Skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Algebra, Geometry, Applied Communication, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development

MASONRY I

STANDARD 6.0

Students will modify masonry processes based on weather conditions.

LEARNING EXPECTATIONS

The student will:

- 6.1 Identify the weather conditions that affect masonry processes.
- 6.2 Demonstrate changes to masonry processes to accommodate weather conditions.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 6.1.A Identifies the sources of current and short-term weather data.
- 6.1.B Analyzes current and forecast weather data that will affect masonry construction processes.
- 6.1.C Explains the observable evidence of weather-related problems in masonry.
- 6.2.A Tests masonry units for moisture content.
- 6.2.B Adjusts moisture content of mortar as required by weather conditions.
- 6.2.C Adjusts admixtures in mortar as required by weather conditions.
- 6.2.D Adjusts temperature of mortar ingredients as required by weather conditions.
- 6.2.E Applies bracing and shoring to new walls as needed to resist wind load.
- 6.2.F Secures scaffolding and provide personnel protection as needed for wind conditions.

SAMPLE PERFORMANCE TASKS

- Research and report on admixtures commercially available in your area.
- Using the Internet and e-mail, contact a mason or masonry organization in a climate different from your own and find out about construction techniques appropriate for that climate.

INTEGRATION LINKAGES

Science, Computer Skills, Research and Writing Skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Algebra, Geometry, Applied Communication, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development, International Brotherhood of Electrical Workers, Plumbing, Heating and Cooling Contractors (PHCC), Air Conditioning and Refrigeration Institute (ARI), American Society of Heating, Refrigeration and Air Conditioning Engineers, ASHRAE), Air Conditioning Contractors of America (ACCA), Occupational Safety and Health Administration (OSHA), Refrigeration Service Engineers Society (RSES).

MASONRY I

STANDARD 7.0

Students will demonstrate bonding and reinforcement in masonry structural members.

LEARNING EXPECTATIONS

The student will:

- 7.1 Demonstrate methods of providing bonding in wall structures.
- 7.2 Demonstrate methods of providing tension and compression reinforcement in walls and columns.
- 7.3 Demonstrate methods of providing shear reinforcement.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 7.1.A Correctly demonstrates bonding using masonry units.
- 7.1.B Correctly demonstrates bonding using steel reinforcement.
- 7.2.A Correctly demonstrates the use of grouted steel reinforcement, both vertically and horizontally, in masonry walls, beams, and pilasters.
- 7.2.B Correctly demonstrates the use of steel joint reinforcement in masonry walls.
- 7.3.A Correctly demonstrates the use of ties and stirrups for shear reinforcement.

SAMPLE PERFORMANCE TASKS

- Build masonry prisms using various bonding and reinforcement techniques.
- Destructively test masonry prisms and compare compressive strength.

INTEGRATION LINKAGES

Science, Computer Skills, Research and Writing Skills, Language Arts, Communication Skills, Leadership Skills, Teamwork Skills, Algebra, Geometry, Applied Communication, Secretary's Commission on Achieving Necessary Skills (SCANS), Skills USA-VICA, Associated Builders and Contractors (ABC), Associated General Contractors (AGC), National Center for Construction Education Research (NCCER), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency, United States Department of Labor, Tennessee Department of Labor and Workforce Development

MASONRY I

SAMPLING OF AVAILABLE RESOURCES

- National Center for Construction Education and Research (NCCER), *Core Curriculum*. Prentice Hall, Upper Saddle River, NJ; ©2000. Also known as the “Wheels of Learning” materials.
- National Center for Construction Education and Research (NCCER), *Masonry Level One*. Prentice Hall, Upper Saddle River, NJ; ©1996. Also known as the “Wheels of Learning” materials.
- National Center for Construction Education and Research (NCCER), *Masonry Level Two*. Prentice Hall, Upper Saddle River, NJ; ©1999. Also known as the “Wheels of Learning” materials.
- National Center for Construction Education and Research (NCCER), *Masonry Level Three*. Prentice Hall, Upper Saddle River, NJ; ©1999. Also known as the “Wheels of Learning” materials.
- James E. Amrhein, *Reinforced Masonry Engineering Handbook*. Masonry Institute of America, Second Edition; ©1972, 1973.
- Jack D. Bakos, Jr., *Structural Analysis for Engineering Technology*. Charles E. Merrill Publishing Company, Columbus, OH; ©1973.
- Paul F. Rice, et. al., *Structural Design Guide to the ACI Building Code*. Van Nostrand Reinhold Company, New York, NY; ©1985.